



STEVAL-TDR001V1

2 stage RF power amp: PD84001 + PD54003L-E + LPF
N-channel enhancement-mode lateral MOSFETs

Feature

- Excellent thermal stability
- Frequency: 380 - 512 MHz
- Supply voltage: 7.2 V
- Output power: 4 W
- Current < 1.6 A
- Input power < 10 dBm
- Harmonics level < -70 dBc
- Load mismatch 20:1
- V_{APC} 5 V max
- Beo free amplifier
- RoHS compliant

Description

The STEVAL-TDR001V1 is a two stage RF power amplifier which includes a low pass output filter for harmonics rejection specifically designed for portable two-way UHF radio communication.

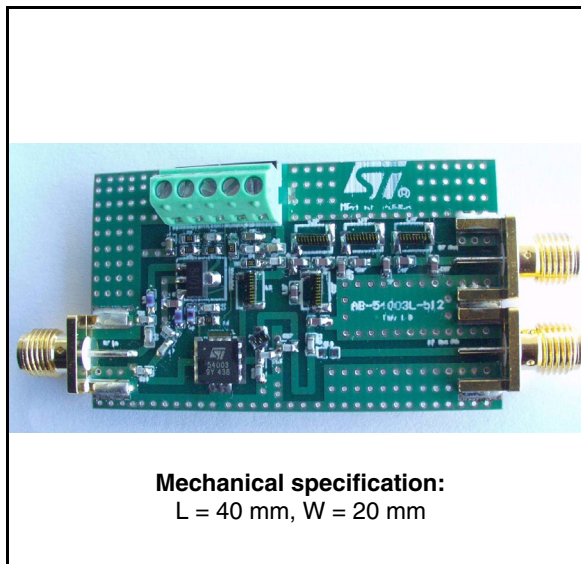


Table 1. Device summary

Order code
STEVAL-TDR001V1

Contents

1	Electrical data	3
1.1	Maximum ratings	3
2	Electrical characteristics	3
3	Typical performance	4
4	Circuit layout	7
5	Circuit schematic	8
6	Package mechanical data	9
6.1	PowerFLAT™ mechanical data	10
6.1.1	Mounting indications	12
6.2	Thermal pad and via design SOT-89	12
6.2.1	Soldering profile	13
7	Revision history	16

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage	15	V
I_D	Drain current	2.5	A
T_{CASE}	Operating case temperature	-20 to +85	°C
T_A	Max. ambient temperature	+55	°C

2 Electrical characteristics

$T_A = +25\text{ °C}$, $V_{DD} = 7.2\text{ V}$, V_{APC} adjusted

Table 3. Electrical specification

Symbol	Test conditions	Min.	Typ.	Max.	Unit
Freq.	Frequency range	380		512	MHz
P_{IN}	@ $P_{OUT} = 4\text{ W}$		10		dBm
I_{TOTAL}	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$			1.6	A
PAE	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$	36% - 40%			
VAPC	@ $P_{OUT} = 4\text{ W}$ and $P_{IN} = 10\text{ dBm}$		4.5	5	V
Harmonics	@ $P_{OUT} = 4\text{ W}$			-70	dBc

3 Typical performance

Figure 1. Current consumption vs frequency **Figure 2. Output power vs frequency**

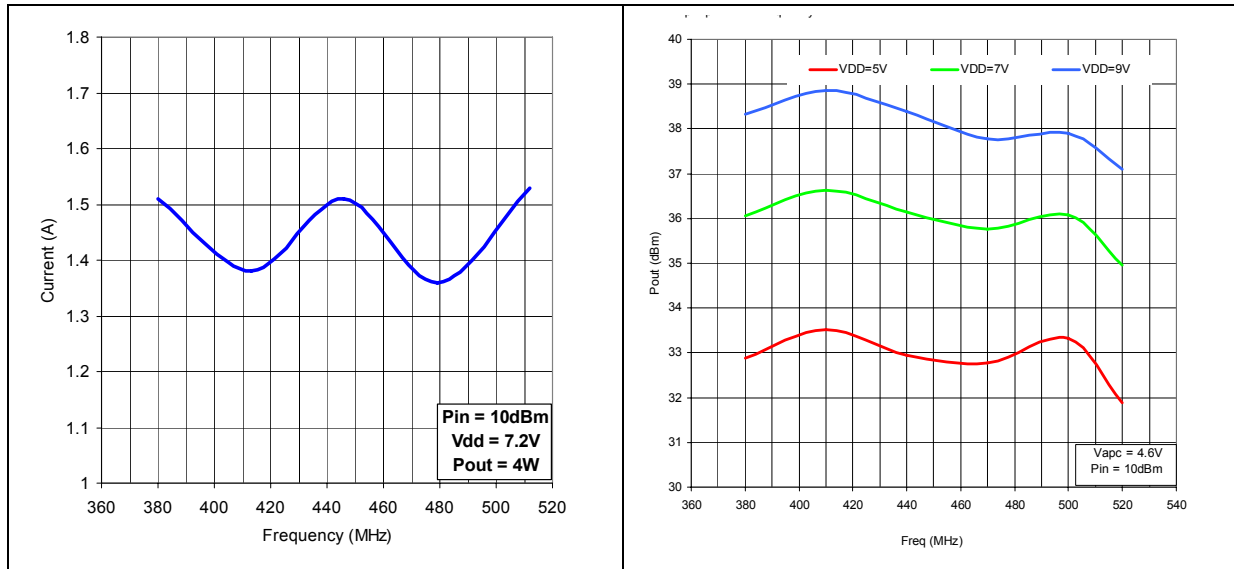


Figure 3. Gain vs frequency

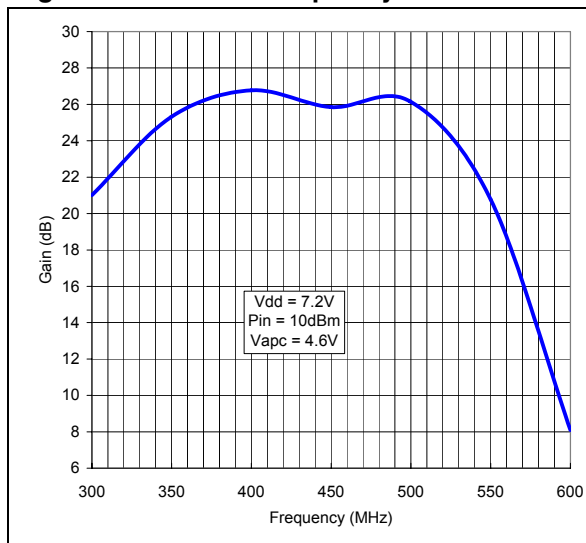


Figure 4. Input return loss vs frequency

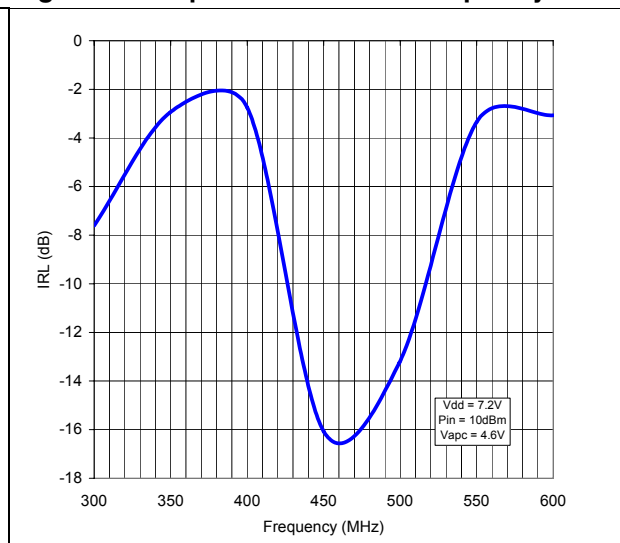


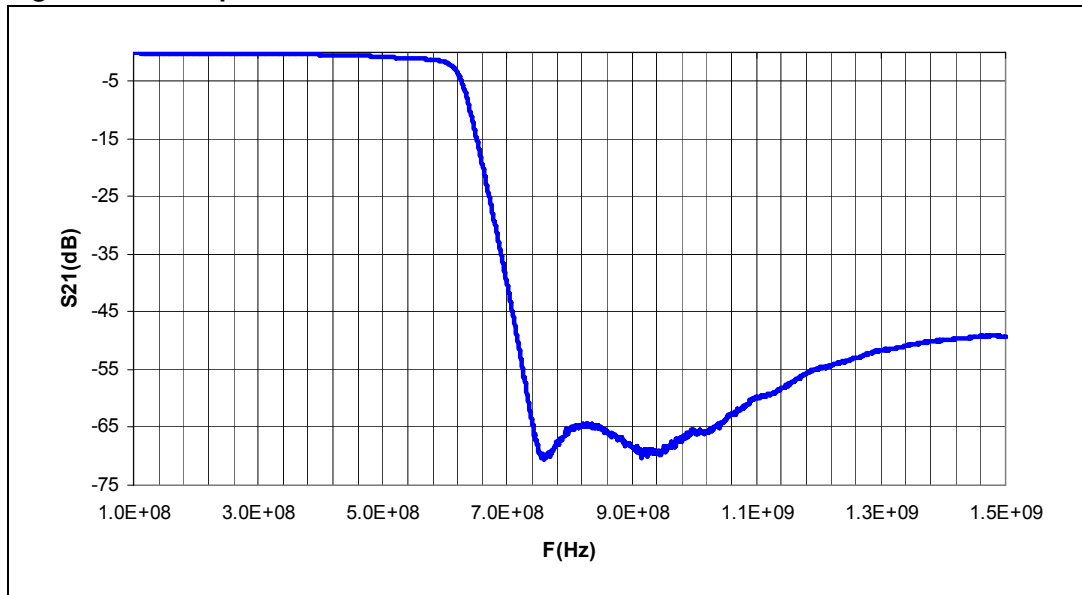
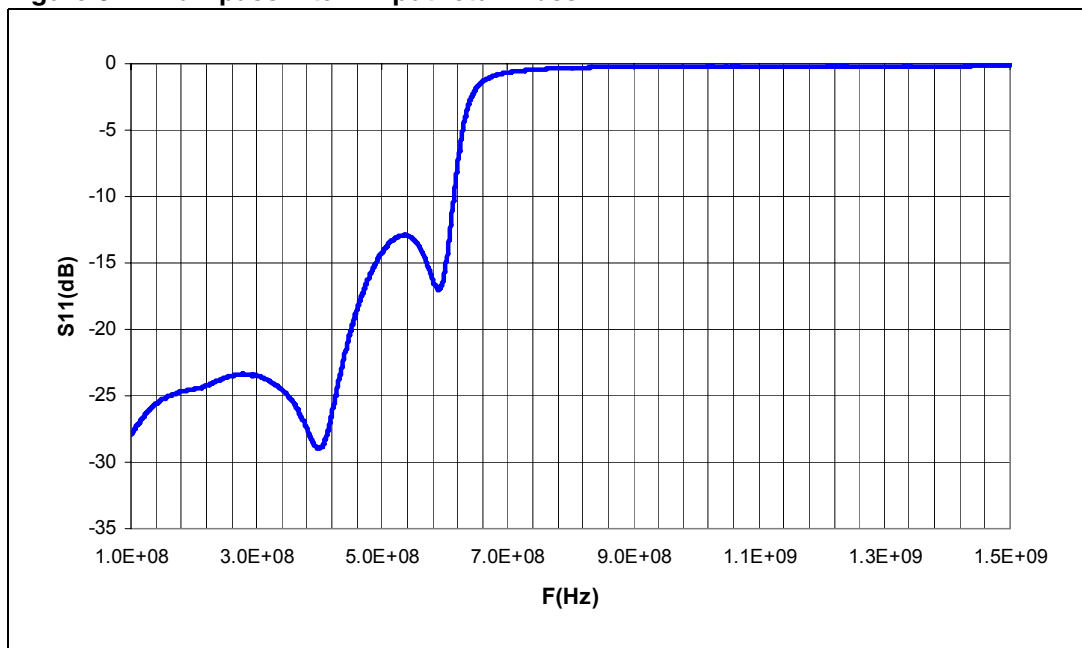
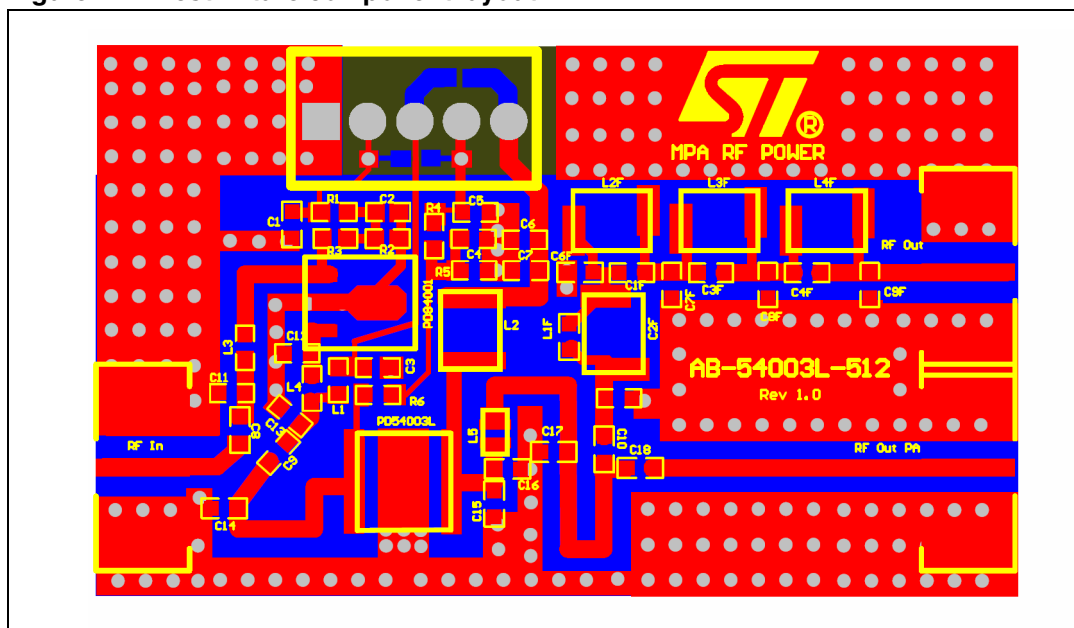
Figure 5. Low pass filter - insertion loss**Figure 6. Low pass filter - input return loss**

Table 4. Part list

Designator	Value	Quantity	Manufacturer	Part code	Size
C1	1 μ F	1	Murata	GRM1885F51C105ZA01	603
C1F	2.2 pF	1	Murata	GRM1885C1H2R2CZ01	603
C2, C3, C4	120 pF	3	Murata	GRM1885C1H121JA01	603
C2F, C3F	3.3 pF	2	Murata	GRM1885C1H3R3CZ01	603
C4F, C5F	2.2 pF	2	Murata	GRM1885C1H2R2CZ01	603
C5, C6	1 μ F	2	Murata	GRM1885F51C105ZA01	603
C6F	4.7 pF	1	Murata	GRM1885C1H4R7CZ01	603
C7	120 nF	1	Murata	GRM1885C1H121JA01	603
C7F, C8F	3.9 pF	2	Murata	GRM1885C1H3R9CZ01	603
C8, C10	470 pF	2	Murata	GRM1885C1H471JA01	603
C9	470 pF	1	Murata	GRM1885C1H471JA01	603
C9F	1.2 pF	1	Murata	GRM1885C1H1R2CZ01	603
C11	15 pF	1	Murata	GRM1885C1H150JA01	603
C12	4.7 pF	1	Murata	GRM1885C1H4R7CZ01	603
C13	18 pF	1	Murata	GRM1885C1H180JA01	603
C14	39 pF	1	Murata	GRM1885C1H390JA01	603
C15, C16	18 pF	2	Murata	GRM1885C1H180JA01	603
C17	15 pF	1	Murata	GRM1885C1H150JA01	603
C18	NC	1	Murata	GRM1885C1H471JA01	603
DC-Con		1	Phoenix contact	1725685	2.54mm, 5 poli
L1	24 nH	1	Coilcraft	0603HC-24NX_BW	603
L1F, L2, L2F, L3F, L4F	12.55 nH	5	Coilcraft	1606-10_, 1606_10	1606
L3, L4	3.6 nH	2	Coilcraft	0603HC-3N6X_BW	603
L5	2.55 nH	1	Coilcraft	0906-3_	906
PD54003L-E		1	STMicroelectronics	PD54003L-E	
PD84001		1	STMicroelectronics	PD84001	
R1	300 Ω	1	Tyco/electronics neohn	CRG series thick film chip	603
R2, R5	3 k Ω	2	Tyco/electronics neohn	CRG series thick film chip	603
R3, R6	15 k Ω	2	Tyco/electronics neohn	CRG series thick film chip	603
R4	1.5 k Ω	1	Tyco/electronics neohn	CRG series thick film chip	603
RF In, RF Out, RF Out PA		3			
SUB		1		FR-4	H=20 mil h=10 oz
TL1	50	1			L=6.88 mm W=0.92 mm
TL2	50	1			L=9.8 mm W=0.92 mm
TL3		1			L=9.8 mm W=0.92 mm
TL4		1			50 Ω

4 Circuit layout

Figure 7. Test fixture component layout



5 **Circuit schematic**

Figure 8. Circuit schematic

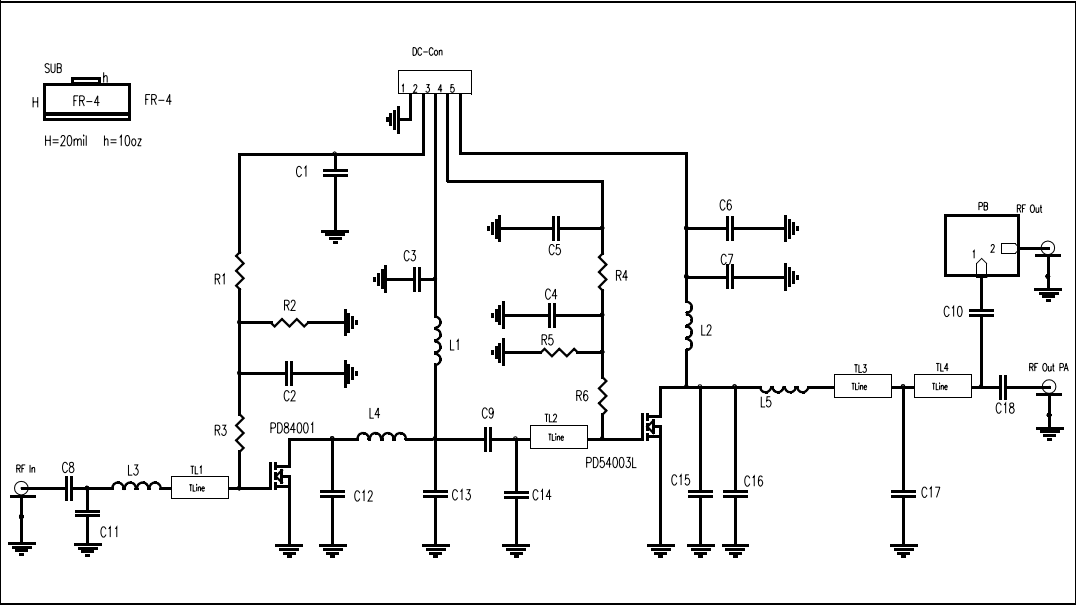
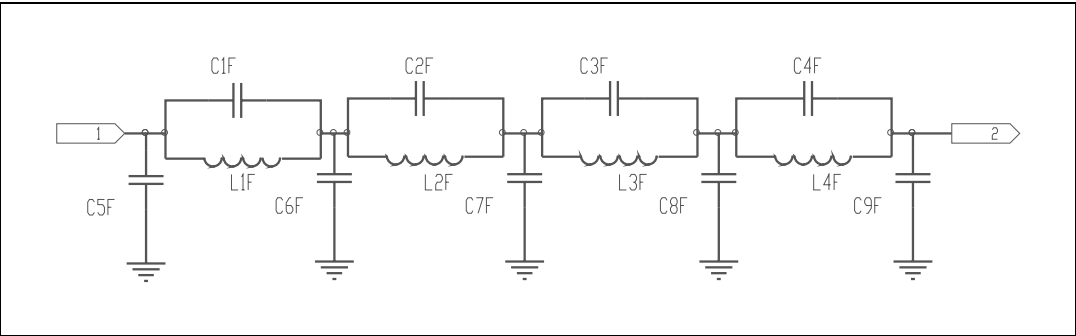


Figure 9. Filter schematic



6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

6.1 PowerFLAT™ mechanical data

Table 5. PowerFLAT™ mechanical data

Dim.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		0.90	1.00		0.035	0.039
A1		0.02	0.05		0.001	0.002
A3		0.24			0.009	
AA	0.15	0.25	0.35	0.006	0.01	0.014
b	0.43	0.51	0.58	0.017	0.020	0.023
c	0.64	0.71	0.79	0.025	0.028	0.031
D		5.00			0.197	
d		0.30			0.011	
E		5.00			0.197	
E2	2.49	2.57	2.64	0.098	0.101	0.104
e		1.27			0.050	
f		3.37			0.132	
g		0.74			0.03	
h		0.21			0.008	

Figure 10. PowerFLAT™ package dimensions

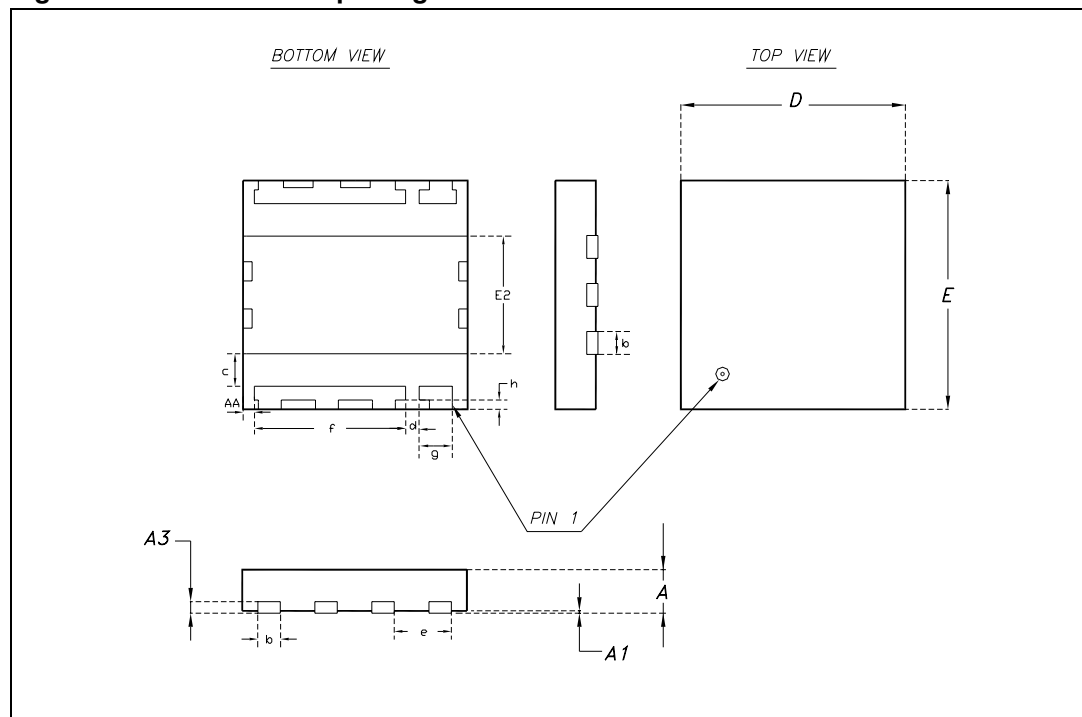
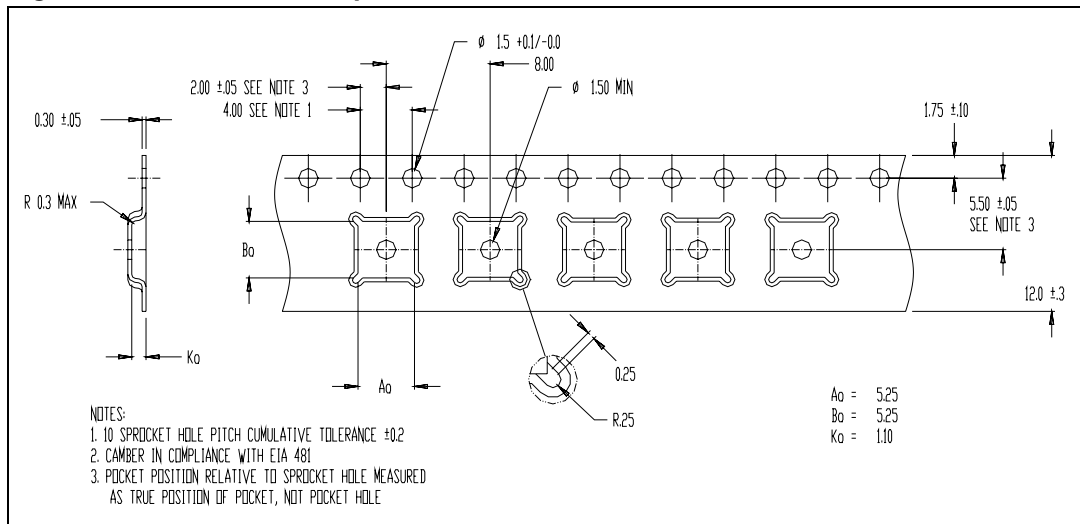


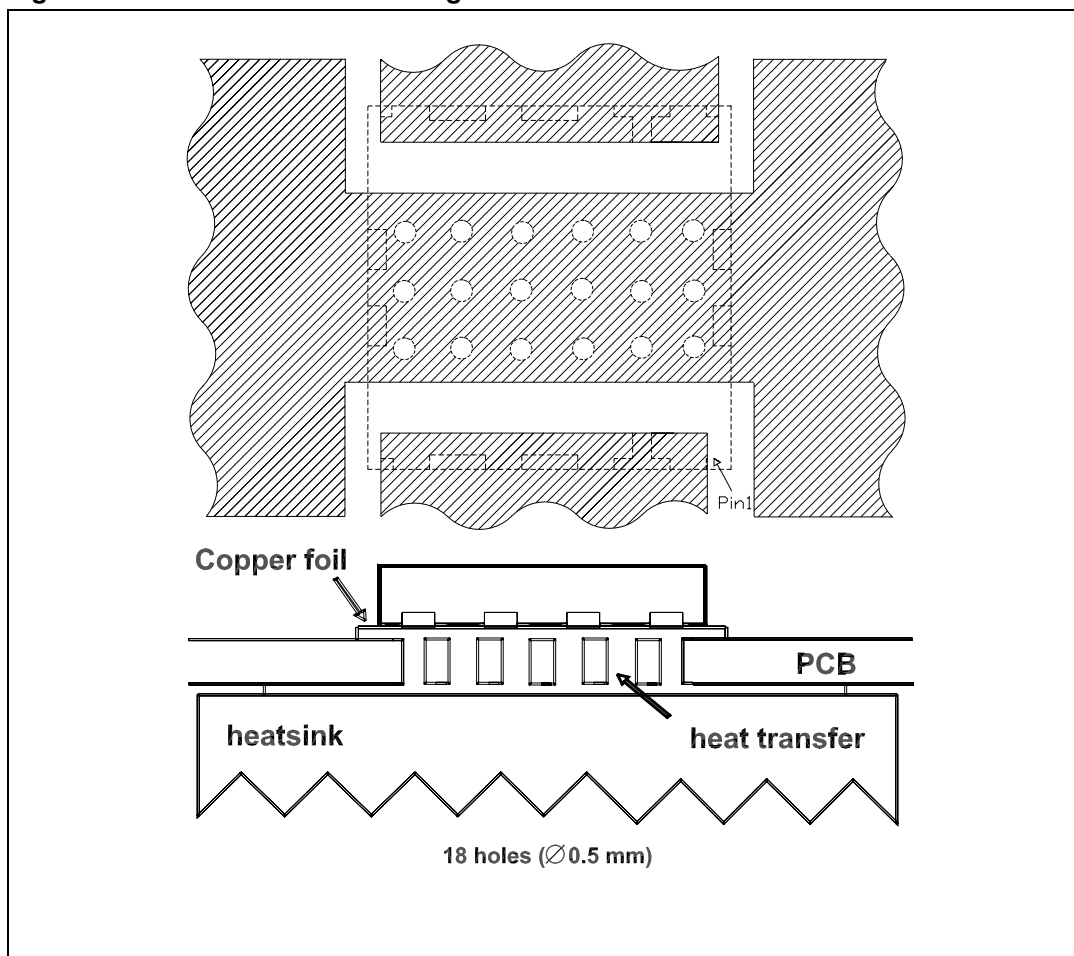
Table 6. PowerFLAT™ tape and reel dimensions

Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ	Max.
Ao	5.15	5.25	5.35	0.12	0.13	0.13
Bo	5.15	5.25	5.35	0.12	0.13	0.13
Ko	1.0	1.1	1.2	0.02	0.02	0.02

Figure 11. PowerFLAT™ tape and reel

6.1.1 Mounting indications

Figure 12. Standard SMD mounting

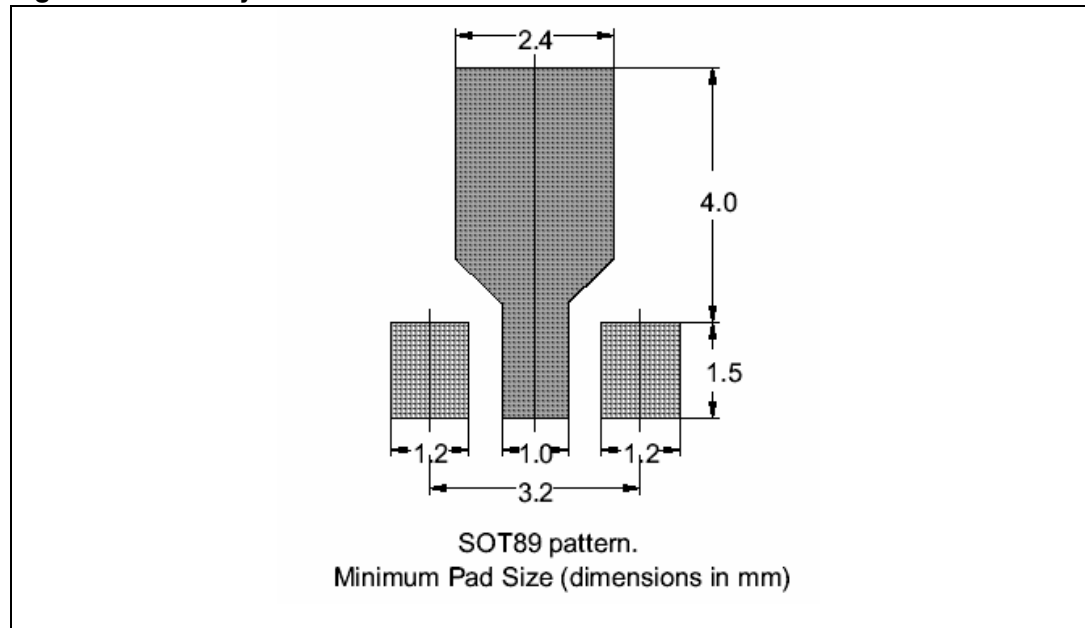


6.2 Thermal pad and via design SOT-89

Thermal vias are required in the PCB layout to effectively conduct heat away from the package. The via pattern has been designed to address thermal, power dissipation and electrical requirements of the device.

The via pattern is based on thru-hole vias with 0.203 mm to 0.330 mm finished hole size on a 0.5 mm to 1.2 mm grid pattern with 0.025 plating on via walls. If micro vias are used in a design, it is suggested that the quantity of vias be increased by a 4:1 ratio to achieve similar results.

Figure 13. Pad layout details



6.2.1 Soldering profile

Figure 14 shows the recommended solder for devices that have Pb-free terminal plating and where a Pb-free solder is used.

Figure 14. Recommended solder profile

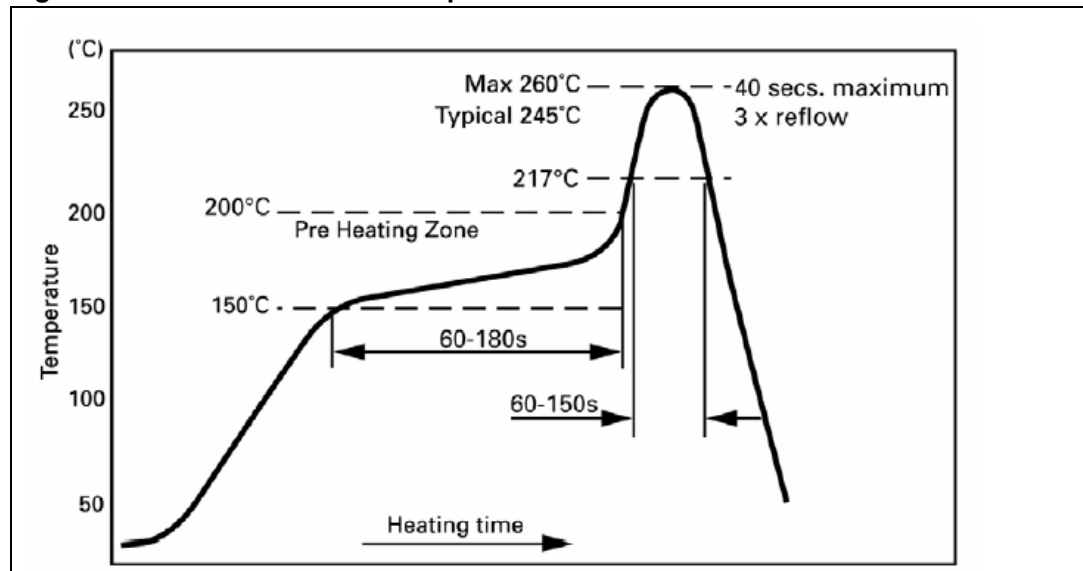


Figure 15 shows the recommended solder for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 15. Recommended solder profile for leaded devices

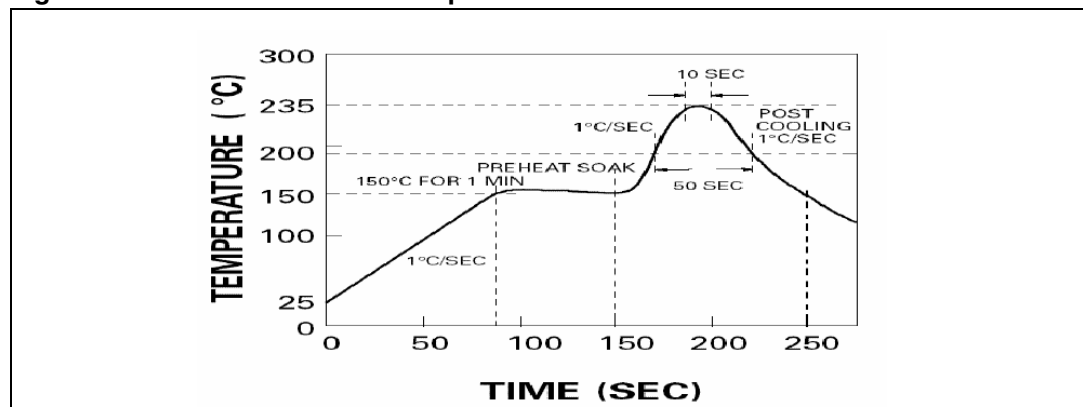
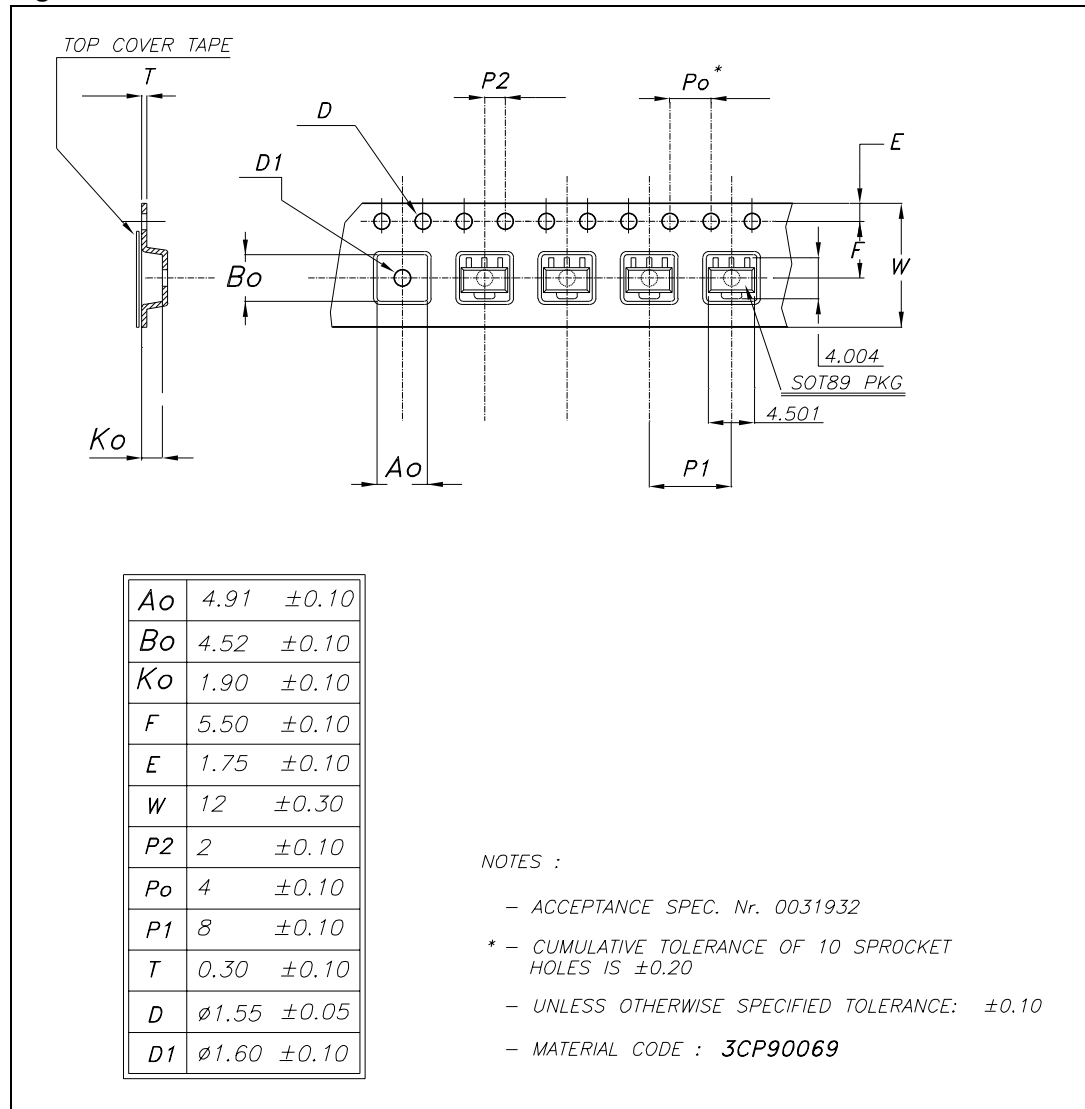


Figure 16. Reel information



7 Revision history

Table 7. Document revision history

Date	Revision	Changes
16-Mar-2009	1	Initial release.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com